

WHAT IS CLAIMED IS:

Sub A1 5

1. A liquid discharge head comprising a heat generating element for generating thermal energy which is used for discharging liquid from a discharge port, and a protective layer provided on said heat generating element to protect said heat generating element,

wherein said protective layer has a first region with a substantially uniform and desired thickness and a second region with a substantially uniform thickness thinner than said desired thickness, the volume of liquid droplets discharged from said discharge port is changed by changing electric energy applied to said heat generating element.

10 15 2. A liquid discharge head according to claim 1, wherein said second region is provided on a side closer to said discharge port than said first region.

Sub A2 20

3. A liquid discharge head according to claim 1, wherein said protective layer is composed of plural layered protective layers, said first region is composed of said plural layered protective layers, and any protective layer of said plural layered protective layers is removed in said second region.

25

4. A liquid discharge head according to claim 3, wherein said second region is formed by forming the

Sub
C2

upper protective layer after etching the lower
protective layer.

5. A liquid discharge head according to claim 4,
wherein said lower protective layer is composed of
phosphosilicate glass film, said upper protective layer
is composed of SiN film, and said etching is conducted
with buffered hydrofluoric acid.

10 6. A liquid discharge head according to claim 3,
wherein said plural layered protective layers are
composed of materials each having different etching
properties, and said second region is formed by forming
said plural layered protective layers and subsequently
15 by selectively etching only the upper layer.

7. A liquid discharge head according to claim 6,
wherein said lower protective layer is composed of SiN
film, said upper protective layer is composed of
20 phosphosilicate glass film, and said selective etching
is conducted with buffered hydrofluoric acid.

8. A liquid discharge head according to claim 6,
wherein said lower protective layer is composed of SiO₂
25 film, said upper protective layer is composed of SiN
film, and said selective etching is conducted with
hot-hydrofluoric acid.

9. A liquid discharge head according to claim 1,
wherein said heat generating element is composed of
material having a positive temperature coefficient.

Sub C3 5
10. A liquid discharge head according to claim 1,
wherein said heat generating element is provided in
plural numbers, a driving circuit having a plurality of
function devices provided for independently driving
said plurality of heat generating element is provided
within the substrate on which said heat generating
element is provided.

Sub Q 15
11. A liquid discharge head comprising a heat
generating element for generating thermal energy which
is used for discharging liquid from a discharge port, a
protective layer provided on said heat generating
element to protect said heat generating element and a
moving member provided facing said heat generating
element and having a free end which is displaced in
accordance with generation of a bubble due to said
thermal energy,

20
25
wherein said protective layer has a first region
with a substantially uniform and desired thickness and
a second region with a substantially uniform thickness
thinner than said desired thickness, the volume of
liquid droplets discharged from said discharge port is
changed by changing electric energy applied to said

Sub
Q3

~~heat generating element.~~

12. A liquid discharge head according to claim
11, wherein said second region is provided on a side
5 closer to said discharge port than said first region.

Sub
Q4

10 13. A liquid discharge head according to claim
11, wherein said protective layer is composed of plural
layered protective layers, said first region is
composed of said plural layered protective layers, and
any protective layer of said plural layered protective
layers is removed in said second region.

Sub
Q5
Sub
Q6
Sub
Q7
Sub
Q8
Sub
Q9

15 14. A liquid discharge head according to claim
13, wherein said second region is formed by forming the
upper protective layer after etching the lower
protective layer.

20 15. A liquid discharge head according to claim
14, wherein said lower protective layer is composed of
phosphosilicate glass film, said upper protective layer
is composed of SiN film, and said etching is conducted
with buffered hydrofluoric acid.

25 16. A liquid discharge head according to claim
13, wherein said plural layered protective layers are
composed of materials having different etching

properties to each other, and said second region is formed by forming said plural layered protective layers and subsequently by selectively etching only the upper layer.

5

17. A liquid discharge head according to claim 16, wherein said lower protective layer is composed of SiN film, said upper protective layer is composed of phosphosilicate glass film, and said selective etching 10 is conducted with buffered hydrofluoric acid.

18. A liquid discharge head according to claim 16, wherein said lower protective layer is composed of SiO₂ film, said upper protective layer is composed of 15 SiN film, and said selective etching is conducted with hot-hydrofluoric acid.

20 *Sab A5* 19. A liquid discharge head according to claim 11, wherein said heat generating element is composed of polycrystalline silicon.

25 *Sab A5* 20. A liquid discharge head according to claim 11, wherein said heat generating element is provided in plural numbers, a driving circuit having a plurality of function devices provided for independently driving said plurality of heat generating element is provided within the substrate on which said heat generating

*Sub
5*

~~element is provided.~~

*Sub
a6*

5

21. A liquid discharge apparatus providing the liquid discharge head according to claim 1 or 11 and a member for providing said liquid discharge head.

10

22. A liquid discharge method using a liquid discharge head having a heat generating element for generating thermal energy which is used for discharging liquid from a discharge port, and a protective layer for protecting said heat generating element, provided on said heat generating element, said protective layer having a first region with a substantially uniform and desired thickness and a second region with a substantially uniform thickness thinner than said desired thickness,

15

wherein a size of a bubble generated on said heat generating element is changed by changing electric energy applied to said heat generating element while keeping a region of the starting point of bubbling to said second region, whereby the volume of liquid droplets discharged from said discharge port is changed.

20

25

23. A liquid discharge method using a liquid discharge head having a heat generating element for generating thermal energy which is used for discharging

60 60 60 60 60 60 60 60

*Sub
a6*

liquid from a discharge port, a protective layer for protecting said heat generating element, provided on said heat generating element and a moving member provided facing said heat generating element and having a free end which is displaced in accordance with 5 generation of a bubble due to said thermal energy, said protective layer having a first region with a substantially uniform and desired thickness and a second region with a substantially uniform thickness 10 thinner than said desired thickness,
wherein a size of a bubble generated on said heat generating element is changed by changing electric energy applied to said heat generating element while keeping a region of the starting point of bubbling to 15 said second region, whereby the volume of liquid droplets discharged from said discharge port is changed.

RECORDED - FEB 20 1980